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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	2011-01-20
First Named Inventor	Kevin J. Humphries
Art Unit	
Examiner Name	
Attorney Docket Number	AL808077

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7173934	B2	2007-02-06	Lapuh, et al.	
	2	7161948	B2	2007-01-09	Sampath, et al.	

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CLAIMS

What is claimed is:

1. An aggregation switch in a multi-chassis system for performing Internet Protocol (IP) multicast snooping, comprising:

a plurality of virtual fabric link (VFL) ports coupled to a VFL, wherein the VFL is connected to a remote aggregation switch, wherein the remote aggregation switch is active and in a separate physical chassis;

a plurality of external ports coupled to at least one edge node and at least one network node;

a database maintaining IP multicast snooping information; and

a chassis management module for receiving the snooping information via at least the external ports, storing the snooping information within the database and sharing the snooping information substantially in real-time with the remote aggregation switch via the VFL.

2. The aggregation switch of claim 1, wherein the chassis management module shares the snooping information with an additional chassis management module on the remote aggregation switch via a logical inter-process communication (IPC) channel over the VFL.

3. The aggregation switch of claim 1, wherein the snooping information includes at least one of group membership information identifying groups for receiving multicast traffic flows, queries for multicast traffic flows, identifiers of multicast traffic flows and identifiers of neighboring multicast routers.

4. The aggregation switch of claim 1, wherein:

one or more of the external ports are member ports of a multi-chassis link aggregation group (MC-LAG) connected to an edge node; and

the remote aggregation switch includes one or more of the member ports of the MC-LAG.

5. The aggregation switch of claim 4, wherein the chassis management module further receives a portion of the snooping information from the remote aggregation switch via the VFL, the portion of the snooping information having remote hardware device information associated therewith, the remote hardware device information including a remote external

port identifier of a remote external port that received the snooping information on the remote aggregation switch.

6. The aggregation switch of claim 5, wherein the chassis management module further:

determines whether the remote hardware device information identifies one of the member ports of the MC-LAG on the remote aggregation switch;

when the remote hardware device information identifies one of the member ports of the MC-LAG on the remote aggregation switch:

determines a local member port of the MC-LAG on the aggregation switch,

creates a membership record for the portion of the snooping information,

stores the membership record and local hardware device information of the local member port of the MC-LAG in the database for the portion of the snooping information, and

uses the local hardware device information to compute a forwarding vector for the portion of the snooping information.

7. The aggregation switch of claim 6, wherein, when the remote hardware device information does not identify one of the member ports of the MC-LAG on the remote aggregation switch, the chassis management module further:

stores the membership record and VFL hardware device information of the VFL in the database for the portion of the snooping information; and

uses the VFL hardware device information to compute a forwarding vector for the portion of the snooping information.

8. The aggregation switch of claim 1, wherein the chassis management module further:

receives a portion of the snooping information from the remote aggregation switch via the VFL, the portion of the snooping information including a source address, group address and flow characteristics of a multicast data source and further including remote hardware device information associated therewith, the remote hardware device information including a remote external port identifier of a remote external port that received the snooping information on the remote aggregation switch;

creates a flow record for the portion of the snooping information;

stores the flow record and VFL hardware device information of the VFL in the database for the portion of the snooping information; and

uses the VFL hardware device information to compute a forwarding vector for the portion of the snooping information.

9. The aggregation switch of claim 1, wherein the aggregation switch is a primary switch and the remote aggregation switch is a secondary switch, and wherein the chassis management module further configures:

a virtual IP interface associated with a virtual IP virtual local area network (VIP VLAN) coupling the primary switch and the secondary switch to a MC-LAG as a stub network to prevent the virtual IP interface from sending and processing received Layer 3 routing control packets on the external ports, the virtual IP interface being further configured as a designated Protocol Independent Multicast (PIM) router for the VIP VLAN; and

a network IP interface associated with a VLAN coupling the primary switch to a network node as a normal IP interface to enable the network interface to send and receive Layer 3 routing control packets for the VIP VLAN on the external ports;

wherein the chassis management module and provides the snooping information to the network IP interface to enable the network IP interface to send and receive the Layer 3 routing control packets on the external ports.

10. The aggregation switch of claim 9, wherein the chassis management module further builds replication vectors for multicast traffic flows based on the Layer 3 routing control packets and provides the replication vectors to the remote aggregation switch.

11. The aggregation switch of claim 1, wherein the aggregation switch is a secondary switch and the remote aggregation switch is a primary switch, and wherein the chassis management module further configures a virtual IP interface associated with a virtual IP virtual local area network (VIP VLAN) coupling the primary switch and the secondary switch to a MC-LAG as a stub network to prevent the virtual IP interface from sending and processing received Layer 3 routing control packets on the external ports.

12. The aggregation switch of claim 1, wherein the chassis management module further builds respective forwarding vectors for multicast traffic flows received from the network nodes via the external ports or the VLF ports based on the snooping information.

13. The aggregation switch of claim 12, wherein the chassis management module further determines a multicast index for a received multicast traffic flow to set-up hardware paths for forwarding the received multicast traffic flow to the external ports in a virtual local area network (VLAN) that requested the received multicast traffic flow via the at least one edge node, the multicast index being used globally between the aggregation switch and the remote aggregation switch.

14. The aggregation switch of claim 13, wherein the chassis management module further builds the forwarding vector for the received multicast traffic flow based on the multicast index.

15. The aggregation switch of claim 13, wherein the aggregation switch is a primary switch and the remote aggregation switch is a secondary switch, and wherein the chassis management module on the primary switch allocates the multicast index for the received multicast traffic flow and shares the multicast index with the secondary switch.

16. The aggregation switch of claim 13, wherein the aggregation switch is a secondary switch and the remote aggregation switch is a primary switch, and wherein the chassis management module on the secondary switch is prevented from allocating the multicast index for the received multicast traffic flow and receives the multicast index from the primary switch.

17. A method for performing Internet Protocol (IP) multicast snooping on an aggregation switch in a multi-chassis system, comprising:

receiving snooping information via at least external ports coupled to at least one edge node and at least one network node;

storing the snooping information within a database; and

sharing the snooping information substantially in real-time with a remote aggregation switch via a virtual fabric link (VFL) therebetween, wherein the remote aggregation switch is active and in a separate physical chassis.

18. The method of claim 17, wherein one or more of the external ports are member ports of a multi-chassis link aggregation group (MC-LAG) connected to an edge node and the remote aggregation switch includes one or more of the member ports of the MC-LAG

connected to the edge node and wherein the receiving the snooping information further includes:

receiving a portion of the snooping information from the remote aggregation switch via the VFL, the portion of the snooping information having remote hardware device information associated therewith, the remote hardware device information including a remote external port identifier of a remote external port that received the snooping information on the remote aggregation switch.

19. The method of claim 18, further comprising:

determining whether the remote hardware device information identifies one of the member ports of the MC-LAG on the remote aggregation switch;

when the remote hardware device information identifies one of the member ports of the MC-LAG on the remote aggregation switch, determining a local member port of the MC-LAG on the aggregation switch and storing a membership record and local hardware device information of the local member port of the MC-LAG in the database for the portion of the snooping information; and

when the source hardware device information does not identify one of the member ports of the MC-LAG on the remote aggregation switch, storing the membership record and VFL hardware device information of the VFL in the database for the portion of the snooping information.

20. The method of claim 17, wherein the aggregation switch is a primary switch and the remote aggregation switch is a secondary switch, and further comprising:

configuring a virtual IP interface associated with a virtual IP virtual local area network (VIP VLAN) coupling the primary switch and the secondary switch to a MC-LAG as a stub network to prevent the virtual IP interface from sending and processing received Layer 3 routing control packets on the external ports, the virtual IP interface being further configured as a designated Protocol Independent Multicast (PIM) router for the VIP VLAN;

configuring a network IP interface associated with a VLAN coupling the primary switch to a network node as a normal IP interface to enable the network interface to send and receive Layer 3 routing control packets for the VIP VLAN on the external ports; and

providing the snooping information to the network IP interface to enable the network IP interface to send and receive the Layer 3 routing control packets on the external ports.

21. The method of claim 17, wherein the aggregation switch is a secondary switch and the remote aggregation switch is a primary switch, and further comprising:

configuring a virtual IP interface associated with a virtual IP virtual local area network (VIP VLAN) coupling the primary switch and the secondary switch to a MC-LAG as a stub network to prevent the virtual IP interface from sending and processing received Layer 3 routing control packets on the external ports.

Certification Under 37 C.F.R. 1.8

Date of Mailing or Transmission: January 22, 2013

I hereby certify that I have caused the document indicated herein on the date indicated above to be transmitted via the Office electronic filing system in accordance with 37 C.F.R. §1.6(a)(4).

BY: /Vicki L. Andrews/ (Signature) Name: Vicki L. Andrews (Typed Name)

PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Kevin J. Humphries
Application No: 13/010,382
Filing Date: 01/20/2011
Confirmation No.: 2586
Examiner: Jung H. Park
Art Unit: 2411
Docket No: AL808077
Title: IP Multicast Snooping and Routing with Multi-Chassis Link Aggregation

RESPONSE TO NON-FINAL OFFICE ACTION DATED OCTOBER 23, 2012

Date: January 22, 2013

United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

In response to an office action dated October 23, 2012 regarding the above-captioned patent application, the Applicant respectfully submits the following amendment and response which is being filed within three (3) months of the mailing date thereof.

The three (3) month due date for responding to the office action falls on January 23, 2013, and the Applicant respectfully asserts that this amendment and response being filed on or before January 23, 2013 is timely filed in accordance with M.P.E.P. §710.05, 35 U.S.C. §21, and 37 C.F.R. §1.7.

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An aggregation switch in a multi-chassis system for performing Internet Protocol (IP) multicast snooping, comprising:

a plurality of virtual fabric link (VFL) ports coupled to a VFL, wherein the VFL is connected to a remote aggregation switch, wherein the remote aggregation switch is active and in a separate physical chassis;

a plurality of external ports coupled to at least one edge node and at least one network node;

a database maintaining IP multicast snooping information; and

a chassis management module for receiving the snooping information via at least the external ports, storing the snooping information within the database and sharing the snooping information substantially in real-time with the remote aggregation switch via the VFL;

wherein the chassis management module further builds respective forwarding vectors for multicast traffic flows received from the at least one network node via the external ports or the VLF ports based on the snooping information;

wherein the chassis management module further determines a multicast index for a received multicast traffic flow to set-up hardware paths for forwarding the received multicast traffic flow to the external ports in a virtual local area network (VLAN) that requested the received multicast traffic flow via the at least one edge node, the multicast index being used globally between the aggregation switch and the remote aggregation switch.

2. (Original) The aggregation switch of claim 1, wherein the chassis management module shares the snooping information with an additional chassis management module on the remote aggregation switch via a logical inter-process communication (IPC) channel over the VFL.

3. (Original) The aggregation switch of claim 1, wherein the snooping information includes at least one of group membership information identifying groups for receiving multicast traffic flows, queries for multicast traffic flows, identifiers of multicast traffic flows and identifiers of neighboring multicast routers.

4. (Original) The aggregation switch of claim 1, wherein:

one or more of the external ports are member ports of a multi-chassis link aggregation group (MC-LAG) connected to an edge node; and

the remote aggregation switch includes one or more of the member ports of the MC-LAG.

5. (Original) The aggregation switch of claim 4, wherein the chassis management module further receives a portion of the snooping information from the remote aggregation switch via the VFL, the portion of the snooping information having remote hardware device information associated therewith, the remote hardware device information including a remote external port identifier of a remote external port that received the snooping information on the remote aggregation switch.

6. (Original) The aggregation switch of claim 5, wherein the chassis management module further:

determines whether the remote hardware device information identifies one of the member ports of the MC-LAG on the remote aggregation switch;

when the remote hardware device information identifies one of the member ports of the MC-LAG on the remote aggregation switch:

determines a local member port of the MC-LAG on the aggregation switch,

creates a membership record for the portion of the snooping information,

stores the membership record and local hardware device information of the local member port of the MC-LAG in the database for the portion of the snooping information, and

uses the local hardware device information to compute a forwarding vector for the portion of the snooping information.

7. (Original) The aggregation switch of claim 6, wherein, when the remote hardware device information does not identify one of the member ports of the MC-LAG on the remote aggregation switch, the chassis management module further:

stores the membership record and VFL hardware device information of the VFL in the database for the portion of the snooping information; and

uses the VFL hardware device information to compute a forwarding vector for the portion of the snooping information.

8. (Original) The aggregation switch of claim 1, wherein the chassis management module further:

receives a portion of the snooping information from the remote aggregation switch via the VFL, the portion of the snooping information including a source address, group address and flow characteristics of a multicast data source and further including remote hardware device information associated therewith, the remote hardware device information including a remote external port identifier of a remote external port that received the snooping information on the remote aggregation switch;

creates a flow record for the portion of the snooping information;

stores the flow record and VFL hardware device information of the VFL in the database for the portion of the snooping information; and

uses the VFL hardware device information to compute a forwarding vector for the portion of the snooping information.

9. (Currently Amended) The aggregation switch of claim 1, wherein the aggregation switch is a primary switch and the remote aggregation switch is a secondary switch, and wherein the chassis management module further configures:

a virtual IP interface associated with a virtual IP virtual local area network (VIP VLAN) coupling the primary switch and the secondary switch to a MC-LAG as a stub network to prevent the virtual IP interface from sending and processing received Layer 3 routing control packets on the external ports, the virtual IP interface being further configured as a designated Protocol Independent Multicast (PIM) router for the VIP VLAN; and

a network IP interface associated with a VLAN coupling the primary switch to a network node as a normal IP interface to enable the network interface to send and receive Layer 3 routing control packets for the VIP VLAN on the external ports;

wherein the chassis management module ~~and~~ provides the snooping information to the network IP interface to enable the network IP interface to send and receive the Layer 3 routing control packets on the external ports.

10. (Original) The aggregation switch of claim 9, wherein the chassis management module further builds replication vectors for multicast traffic flows based on the Layer 3 routing control packets and provides the replication vectors to the remote aggregation switch.

11. (Original) The aggregation switch of claim 1, wherein the aggregation switch is a secondary switch and the remote aggregation switch is a primary switch, and wherein the chassis management module further configures a virtual IP interface associated with a virtual IP virtual local area network (VIP VLAN) coupling the primary switch and the secondary switch to a MC-LAG as a stub network to prevent the virtual IP interface from sending and processing received Layer 3 routing control packets on the external ports.

12. (Canceled)

13. (Canceled)

14. (Currently Amended) The aggregation switch of claim ~~13~~ 1, wherein the chassis management module further builds the forwarding vector for the received multicast traffic flow based on the multicast index.

15. (Currently Amended) The aggregation switch of claim ~~13~~ 1, wherein the aggregation switch is a primary switch and the remote aggregation switch is a secondary switch, and wherein the chassis management module on the primary switch allocates the multicast index for the received multicast traffic flow and shares the multicast index with the secondary switch.

16. (Currently Amended) The aggregation switch of claim ~~13~~ 1, wherein the aggregation switch is a secondary switch and the remote aggregation switch is a primary switch, and wherein the chassis management module on the secondary switch is prevented from

allocating the multicast index for the received multicast traffic flow and receives the multicast index from the primary switch.

17. (Currently Amended) A method for performing Internet Protocol (IP) multicast snooping on an aggregation switch in a multi-chassis system, comprising:

receiving snooping information via at least external ports coupled to at least one edge node and at least one network node;

storing the snooping information within a database; ~~and~~

sharing the snooping information substantially in real-time with a remote aggregation switch via a virtual fabric link (VFL) therebetween, wherein the remote aggregation switch is active and in a separate physical chassis

building respective forwarding vectors for multicast traffic flows received from the at least one network node based on the snooping information; and

determining a multicast index for a received multicast traffic flow to set-up hardware paths for forwarding the received multicast traffic flow to the external ports in a virtual local area network (VLAN) that requested the received multicast traffic flow via the at least one edge node, the multicast index being used globally between the aggregation switch and the remote aggregation switch.

18. (Original) The method of claim 17, wherein one or more of the external ports are member ports of a multi-chassis link aggregation group (MC-LAG) connected to an edge node and the remote aggregation switch includes one or more of the member ports of the MC-LAG connected to the edge node and wherein the receiving the snooping information further includes:

receiving a portion of the snooping information from the remote aggregation switch via the VFL, the portion of the snooping information having remote hardware device information associated therewith, the remote hardware device information including a remote external port identifier of a remote external port that received the snooping information on the remote aggregation switch.

19. (Original) The method of claim 18, further comprising:

determining whether the remote hardware device information identifies one of the member ports of the MC-LAG on the remote aggregation switch;

when the remote hardware device information identifies one of the member ports of the MC-LAG on the remote aggregation switch, determining a local member port of the MC-LAG on the aggregation switch and storing a membership record and local hardware device information of the local member port of the MC-LAG in the database for the portion of the snooping information; and

when the source hardware device information does not identify one of the member ports of the MC-LAG on the remote aggregation switch, storing the membership record and VFL hardware device information of the VFL in the database for the portion of the snooping information.

20. (Original) The method of claim 17, wherein the aggregation switch is a primary switch and the remote aggregation switch is a secondary switch, and further comprising:

configuring a virtual IP interface associated with a virtual IP virtual local area network (VIP VLAN) coupling the primary switch and the secondary switch to a MC-LAG as a stub network to prevent the virtual IP interface from sending and processing received Layer 3 routing control packets on the external ports, the virtual IP interface being further configured as a designated Protocol Independent Multicast (PIM) router for the VIP VLAN;

configuring a network IP interface associated with a VLAN coupling the primary switch to a network node as a normal IP interface to enable the network interface to send and receive Layer 3 routing control packets for the VIP VLAN on the external ports; and

providing the snooping information to the network IP interface to enable the network IP interface to send and receive the Layer 3 routing control packets on the external ports.

21. (Original) The method of claim 17, wherein the aggregation switch is a secondary switch and the remote aggregation switch is a primary switch, and further comprising:

configuring a virtual IP interface associated with a virtual IP virtual local area network (VIP VLAN) coupling the primary switch and the secondary switch to a MC-LAG as a stub network to prevent the virtual IP interface from sending and processing received Layer 3 routing control packets on the external ports.

REMARKS/ARGUMENTS

Claims 12 and 13 have been canceled. Thus, the claims presently pending are Claims 1-11 and 14-21. Claims 1, 9 and 14-17 have been amended. Claim 9 has been amended merely to correct a typographical error. Claims 14-16 have been amended to provide proper claim dependency due to the cancelation of Claim 13. Applicant respectfully requests entry of these amendments in view of the following remarks.

In the Office Action, Claims 1-5, 12, 17, 18, and 21 were rejected 35 USC §103(a) as being unpatentable over Salam et al. (US 2010/0020680) in view of Weyman et al. (US 2005/0041665). In addition, Claims 6-11 and 13-16, 19, and 20 were objected to as being dependent upon a rejected base claim, but indicated as being allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant thanks the Examiner for the indication that Claims 6-11, 13-16, 19 and 20 contain allowable subject matter.

Applicant has amended independent Claims 1 and 17 to incorporate the allowable subject matter of Claim 13, and canceled Claims 12-13 as a result. As such, Applicant respectfully requests the Examiner withdraw the 35 U.S.C. § 103 rejections of Claims 1 and 17.

Claims 2-5, 18 and 21 are dependent upon Claims 1 and 17, respectively, and introduce additional patentable subject matter. The Applicant believes that the reasons that distinguish Claims 1 and 17 over the present rejection are applicable in distinguishing claims 2-5, 18 and 21 over the same rejection.

Claims 6-11, 19 and 20 are dependent upon Claims 1 and 17, respectively, and introduce additional patentable subject matter. The Applicant respectfully submits that Claims 6-11, 19 and 20 are allowable for the reasons provided above with respect to Claims 1 and 17, and for the reasons provided by the Examiner.

CONCLUSION

For the foregoing reasons, the Applicant believes that Claims 1-11 and 14-21 are in condition for allowance and respectfully request that they be passed to allowance.

The Applicant hereby rescinds any disclaimer of claim scope made in the parent application or any predecessor application in relation to the instant application. The Examiner is advised that any such previous disclaimer and the prior art that it was made to avoid, may need to be revisited. Further, the claims in the instant application may be broader than those of a parent application. Moreover, the Examiner should also be advised that any disclaimer made in the instant application should not be read into or against the parent application.

No additional fees are believed to be due. In the event that additional fees are due or a credit for an overpayment is due, the Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Garlick & Markison Deposit Account No. 50-2126.

The Examiner is invited to contact the undersigned by telephone or email if the Examiner believes that such a communication would advance the prosecution of the present invention.

RESPECTFULLY SUBMITTED,

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